TFT LCD Approval Specification

MODEL NO.: V470H2 – P01

Customer: _____

Approved by:_____

Note:

Approved By	TV Head Division
	LY Chen

Reviewed By	QA Dept.	Product Development Div.
	Hsin-nan Chen	WT Lin

Prepared By	LCD TV Marketing and Product Management Div.
	CY Chang TC Chao

CONTENTS

REVISION HISTORY

Version	Date	Page(New)	Section	Description
Ver. 1.0	Jun. 11.2009	All	All	The preliminary specification was first issued.
Ver. 2.0	Sep.21.2009	All	All	The Approval specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V470H2-P01 is a 47" TFT Liquid Crystal Display module with driver ICs and 2ch mini-LVDS interface. This product supports 1920 x 1080 Full HDTV format and can display 16.7M colors (8-bit/color). The backlight unit is not built-in.

1.2 FEATURES

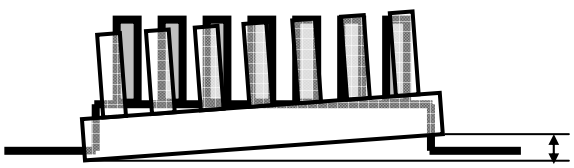
CHARACTERISTICS ITEMS	SPECIFICATIONS
Screen Diagonal [in]	47"
Pixels [lines]	1920 × 1080
Active Area [mm]	1039.68 (H) x584.82 (V) (47" diagonal)
Sub-Pixel Pitch [mm]	0.5415(V) ×0.1805(H)
Pixel Arrangement	RGB vertical stripe
Weight [g]	2560
Physical Size [mm]	1059.78(W) × 605.87(H) × 1.80(D) Typ.
Display Mode	Transmissive mode / Normallly black
Contrast Ratio	4000:1 Typ. (Typical value measure at CMO's module)
Glass thickness (Array / CF) [mm]	0.7 / 0.7
Viewing Angle (CR>20)	+88/-88(H), +88/-88(V) Typ. (CR≧20) (Typical value measure at CMO's module)
Color Chromaticity	R = (0.649, 0.331) G = (0.271, 0.595) B = (0.148, 0.103) W= (0.313, 0.349) * Please refer to "color chromaticity" on p.14
Cell Transparency [%]	4.5%
Polarizer Surface Treatment	Anti-Glare coating (Haze 11%), Hard coating (3H)

1.3 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	2510	2560	2610	g	-
I/F connector mounting position	The mounting inclination of the connector makes the screen center within ± 0.5mm as the horizontal.				(2)

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Connector mounting position



+/- 0.5mm

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASE ON CMO MODULE V470H2-P01)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	TST	-20	+60	ºC	(1)
Operating Ambient Temperature	TOP	0	50	ºC	(1), (2)
Shock (Non-Operating)	SNOP	-	50	G	(3), (5)
Vibration (Non-Operating)	VNOP	-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

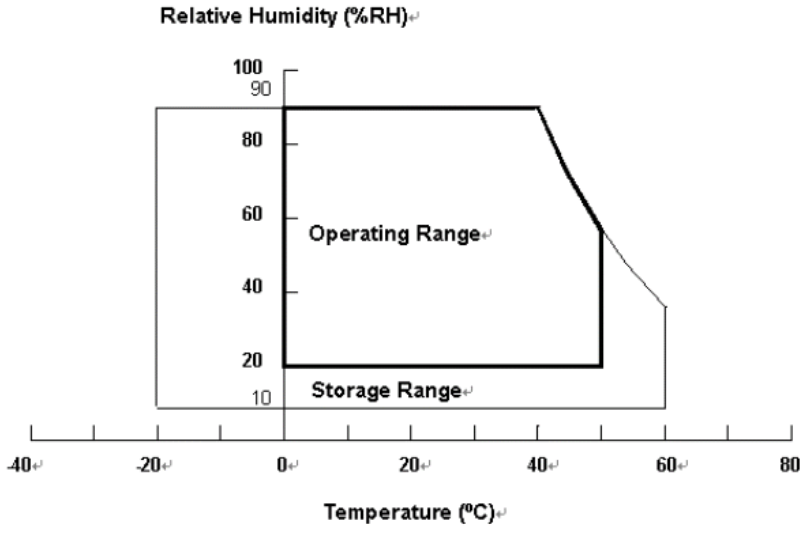
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 200 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



2.2 PACKAGE STORAGE

Storage condition: With shipping package.

Storage temperature rang: 25±5℃

Storage humidity range: 50±10%RH

Shelf life: a month

2.3 ELECTRICAL ABSOLUTE RATINGS

2.3.1 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V_{AA}	-0.5	+18.5	V	(1)
Power Supply Voltage	V_{GH}	-0.3	+30.0	V	
Power Supply Voltage	V_{GL}	-10.0	-0.3	V	
Logic Input Voltage	V_{DD}	-0.3	4.0	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

(Ta = 25 ± 2 ºC)

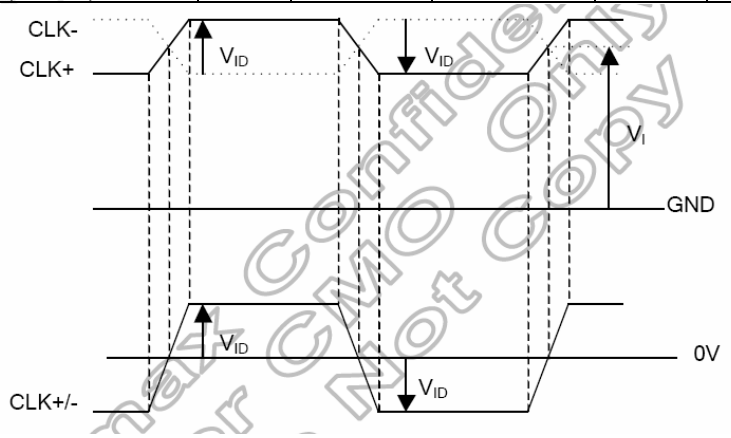
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{GH}	29	30	31	V	
		V_{GL}	-8.5	-8.0	-7.5	V	
		V_{AA}	17.4	17.7	18	V	
		V_{DD}	3.2	3.3	3.4	V	
		V_{REF}	16.85	17.00	17.15	V	
Power Supply Current		I_{GH}	-	15		mA	
		I_{GL}	-	8	-	mA	
		I_{AA}	-	380	-	mA	
		I_{DD}		250		mA	
CMOS interface	Input High Threshold Voltage	V_{IH}	$0.7V_{DD}$	-	V_{DD}	V	
	Input Low Threshold Voltage	V_{IL}	0	-	$0.3V_{DD}$	V	

Note (1) The module should be always operated within the above ranges.

3.2 Mini-LVDS CHARACTERISTICS

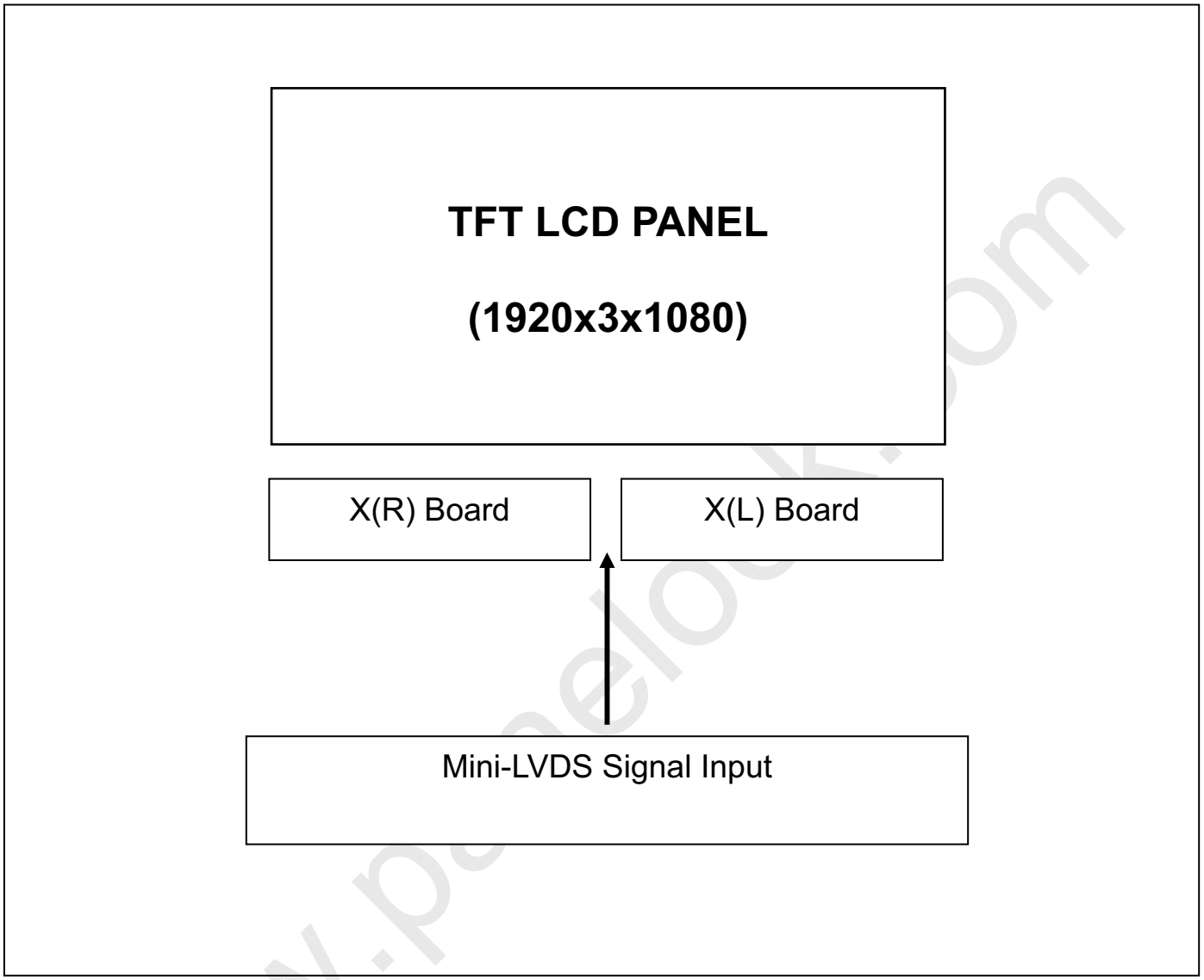
(Ta = -20 to + 85 ºC)

Item	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
mini-LVDS differential voltage (amplitude: peak to peak)	V_{ID}	-	100	-	600	mV
mini-LVDS common mode input voltage range (center)	V_I	-	VSS+0.5	1.2	VDD-1.2	V



4. BLOCK DIAGRAM OF INTERFACE

4.1 TFT LCD MODULE



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD Module Input

Pin assignment

CN1(XL) Connector Pin Assignment

Pin	Symbol	Description	Pin	Symbol	Description
1	GND	Ground	41	GM6	Gamma Power supply
2	NC	No connection	42	GM5	Gamma Power supply
3	NC	No connection	43	GM4	Gamma Power supply
4	GND	Ground	44	GM3	Gamma Power supply
5	NC	No connection	45	GM2	Gamma Power supply
6	NC	No connection	46	GM1	Gamma Power supply
7	NC	No connection	47	GND	Ground
8	NC	No connection	48	NC	No connection
9	NC	No connection	49	POL	Polarity invert
10	NC	No connection	50	A_TP1	Mini-LVDS data latch input
11	GND	Ground	51	GND	Ground
12	ML5N_F	Mini-LVDS data input	52	VAA	Driver power supply
13	ML5P_F	Mini-LVDS data input	53	VAA	Driver power supply
14	ML4N_F	Mini-LVDS data input	54	GND	Ground
15	ML4P_F	Mini-LVDS data input	55	VDD	Logic Power supply
16	ML3N_F	Mini-LVDS data input	56	VDD	Logic Power supply
17	ML3P_F	Mini-LVDS data input	57	GND	Ground
18	GND	Ground	58	VGH	Driver Power supply
19	CLKN_F	Mini-LVDS Clock input	59	VGH	Driver Power supply
20	CLKP_F	Mini-LVDS Clock input	60	GND	Ground
21	GND	Ground	61	NC	No connection
22	ML2N_F	Mini-LVDS data input	62	VCM	VCM Power supply
23	ML2P_F	Mini-LVDS data input	63	VCM	VCM Power supply
24	ML1N_F	Mini-LVDS data input	64	GND	Ground
25	ML1P_F	Mini-LVDS data input	65	VGL	Driver Power supply
26	ML0N_F	Mini-LVDS data input	66	OE1	Scan driver output enable
27	ML0P_F	Mini-LVDS data input	67	CKV	Scan driver clock
28	GND	Ground	68	STV	Scan driver start pulse
29	GM18	Gamma Power supply	69	GND	Ground
30	GM17	Gamma Power supply	70	OE2	Scan driver output enable
31	GM16	Gamma Power supply	71	NC	No connection
32	GM15	Gamma Power supply	72	NC	No connection
33	GM14	Gamma Power supply	73	NC	No connection
34	GM13	Gamma Power supply	74	NC	No connection
35	GM12	Gamma Power supply	75	NC	No connection
36	GM11	Gamma Power supply	76	NC	No connection
37	GM10	Gamma Power supply	77	NC	No connection
38	GM9	Gamma Power supply	78	NC	No connection
39	GM8	Gamma Power supply	79	NC	No connection
40	GM7	Gamma Power supply	80	GND	Ground

CN1(XR) Connector Pin Assignment

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	41	GM12	Gamma Power supply
2	VSCM	VCM adjust from VR	42	GM11	Gamma Power supply
3	NC	No connection	43	GM10	Gamma Power supply
4	NC	No connection	44	GM9	Gamma Power supply
5	NC	No connection	45	GM8	Gamma Power supply
6	NC	No connection	46	GM7	Gamma Power supply
7	NC	No connection	47	GM6	Gamma Power supply
8	NC	No connection	48	GM5	Gamma Power supply
9	NC	No connection	49	GM4	Gamma Power supply
10	NC	No connection	50	GM3	Gamma Power supply
11	OE2	Scan driver output enable	51	GM2	Gamma Power supply
12	GND	Ground	52	GM1	Gamma Power supply
13	OE1	Scan driver output enable	53	GND	Ground
14	CKV	Scan driver clock	54	ML5N_B	Mini-LVDS data input
15	STV	Scan driver start pulse	55	ML5P_B	Mini-LVDS data input
16	VGL	Driver Power supply	56	ML4N_B	Mini-LVDS data input
17	GND	Ground	57	ML4P_B	Mini-LVDS data input
18	VCM	VCM Power supply	58	ML3N_B	Mini-LVDS data input
19	VCM	VCM Power supply	59	ML3P_B	Mini-LVDS data input
20	NC	No connection	60	GND	Ground
21	GND	Ground	61	CLKN_B	Mini-LVDS Clock input
22	VGH	Driver Power supply	62	CLKP_B	Mini-LVDS Clock input
23	VGH	Driver Power supply	63	GND	Ground
24	GND	Ground	64	ML2N_B	Mini-LVDS data input
25	VDD	Logic Power supply	65	ML2P_B	Mini-LVDS data input
26	VDD	Logic Power supply	66	ML1N_B	Mini-LVDS data input
27	GND	Ground	67	ML1P_B	Mini-LVDS data input
28	VAA	Driver power supply	68	ML0N_B	Mini-LVDS data input
29	VAA	Driver power supply	69	ML0P_B	Mini-LVDS data input
30	GND	Ground	70	GND	Ground
31	POL	Polarity invert	71	NC	No connection
32	B_TP1	Mini-LVDS data latch input	72	NC	No connection
33	NC	No connection	73	NC	No connection
34	GND	Ground	74	NC	No connection
35	GM18	Gamma Power supply	75	NC	No connection
36	GM17	Gamma Power supply	76	NC	No connection
37	GM16	Gamma Power supply	77	GND	Ground
38	GM15	Gamma Power supply	78	NC	No connection
39	GM14	Gamma Power supply	79	NC	No connection
40	GM13	Gamma Power supply	80	GND	Ground

Note (1) CN1、2 Connector Part No.: GB5RF801-125C-7F,Foxconn KunShan(富士康昆山) or equal.

Note (2) The OE1 and OE2 must be connected to the OE.

5.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of the color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red (253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green (253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

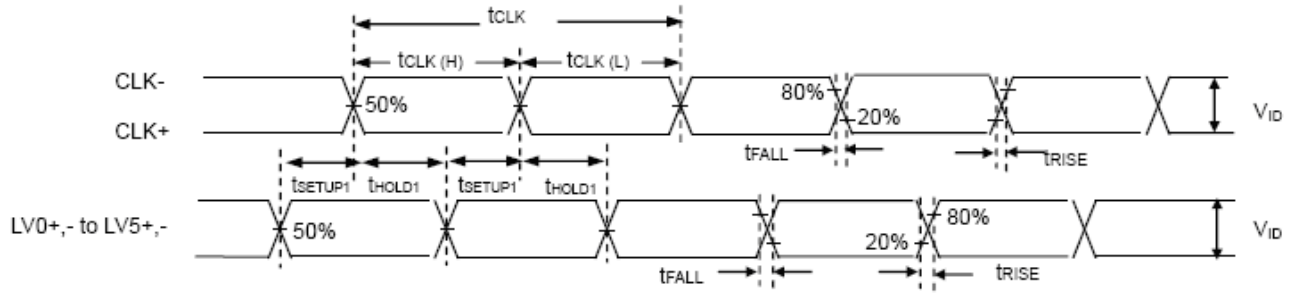
6.1 INPUT SIGNAL TIMING SPECIFICATIONS(Ta = 25 ± 2 ºC)

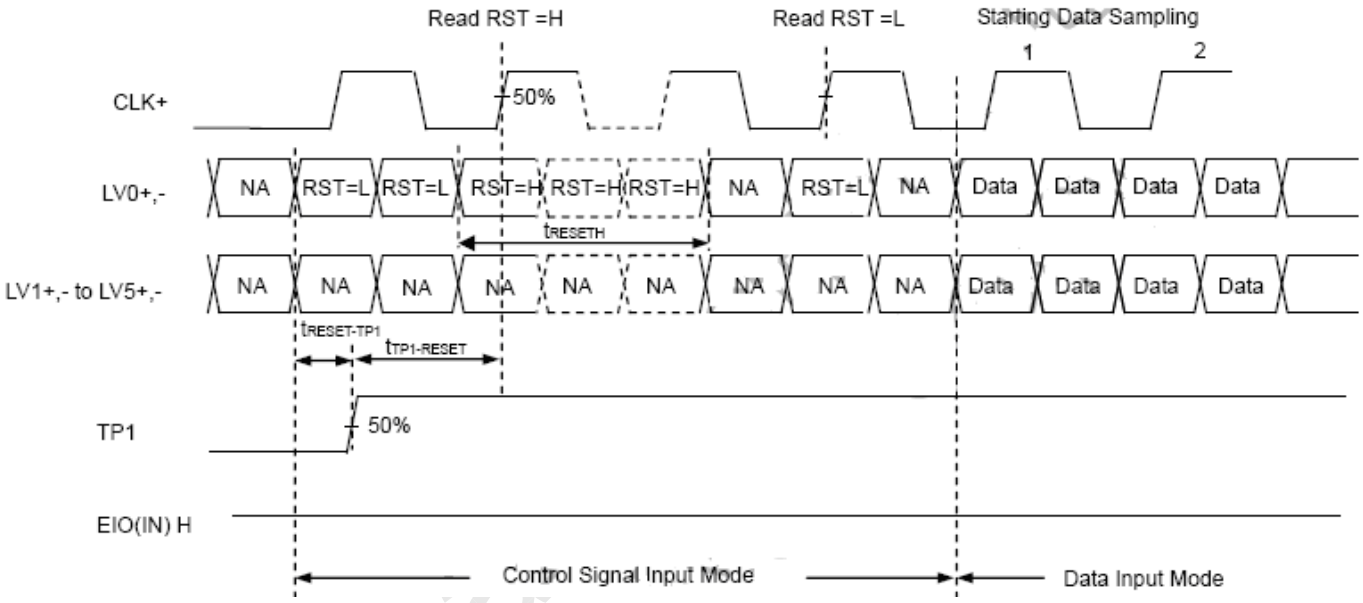
(a) Timing Spec

	Parameter	Symbol	Condition	Spec			Unit
				Min.	Typ.	Max.	
HD	Clock period	t_{CLK}	-	4(1)	-	-	ns
	Clock low pulse width	$t_{CLK(L)}$	-	1.7	-	-	ns
	Clock high pulse width	$t_{CLK(H)}$	-	1.7	-	-	ns
	Data setup time	t_{SETUP1}	-	0.8	-	-	ns
	Data hold time	t_{HOLD1}	-	0.8	-	-	ns
	CLK,LV [5:0] rising time	t_{RISE}		-	-	0.8	ns
	CLK,LV [5:0] falling time	t_{FALL}		-	-	0.8	ns
	Start pulse setup time	t_{SETUP2}		0	-	-	ns
	Start pulse delay time	t_{PLH1}	Loading=15pF	-	-	13	ns
		t_{PHL1}	Loading=15pF	-	-	13	ns
	Reset(RST) high time	t_{RESETH}		50ns over 3 CLK	-	-	-
	TP1 high period	$t_{TP1(H)}$		200	-	-	ns
	POL to TP1 setup time	$t_{POL-TP1}$	POL toggle to TP1 rising	5	-	-	ns
	TP1 to POL hold time	$t_{TP1-POL}$	TP1 falling to POL toggle	6	-	-	ns
	Receiver off to TP1 timing	$t_{REC-OFF}$		5	-	-	CLK
	TP1 to reset input time	$t_{TP-RESET}$		200	-	-	ns
	Reset low to TP1 rising time	$t_{RESET-TP1}$		0			ns
	Output delay time1	t_{PD1}	CL=100pF	-	-	5	μs
	Output delay time2	t_{PD2}	CL=100pF	-	-	10	μs
	Output delay time3	t_{PD3}	CL=100Pf	-	-	5	μs
	Output delay time4	t_{PD4}	CL=100pF	-	-	10	μs
VD	CKV period	t_{CKV}	-	5	-	-	μs
	CKV pulse width	t_{CKVH}, t_{CKVL}	50% duty cycle	2.5	-	-	μs
	OE pulse width	t_{WOE}	-	1	-	-	μs
	Data setup time	t_{SU}		0.5	-	-	μs
	Data hold time	t_{HD}		0.5	-	-	μs
	CKV to output delay time	t_{PD1}	CL=300pF	-	-	1	μs
	Start pulse output delay time	t_{PD2}	- CL=300pF	-	-	0.8	μs
	OE to output delay time	t_{PD3}	CL=300pF	-	-	0.8	μs

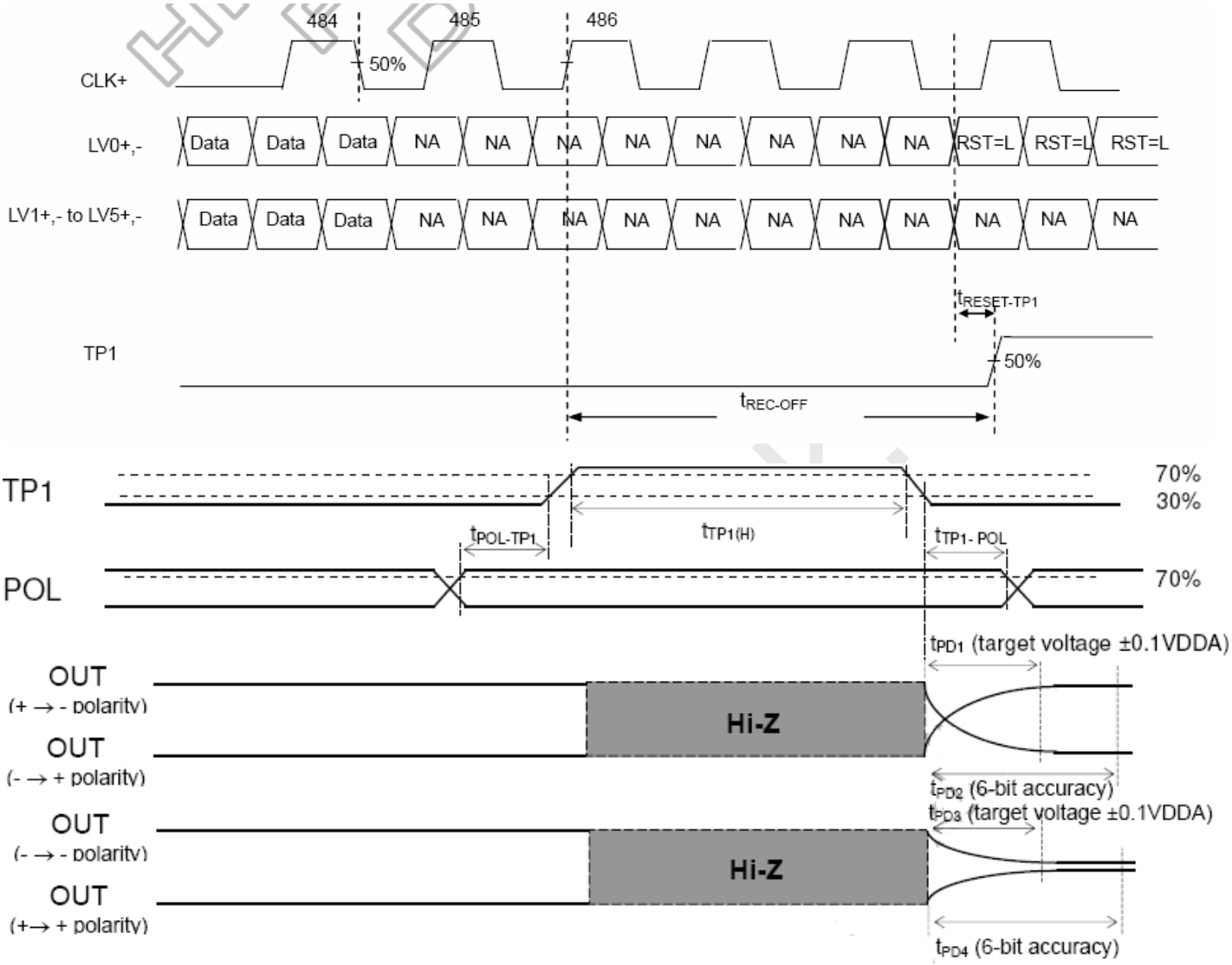
Note (1) : When operation frequency=250MHz

(b) Horizontal Timing Chart

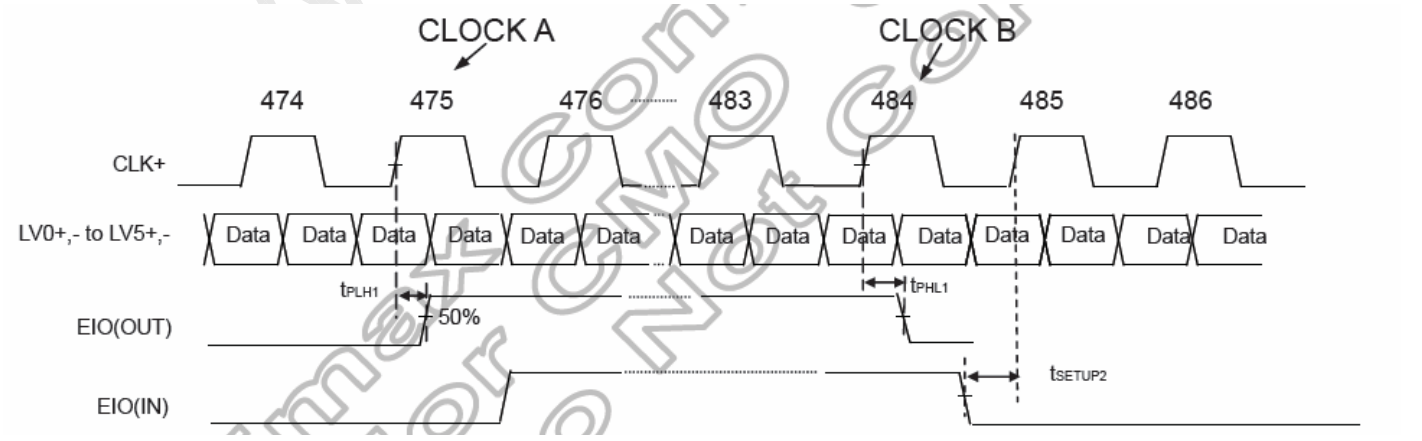




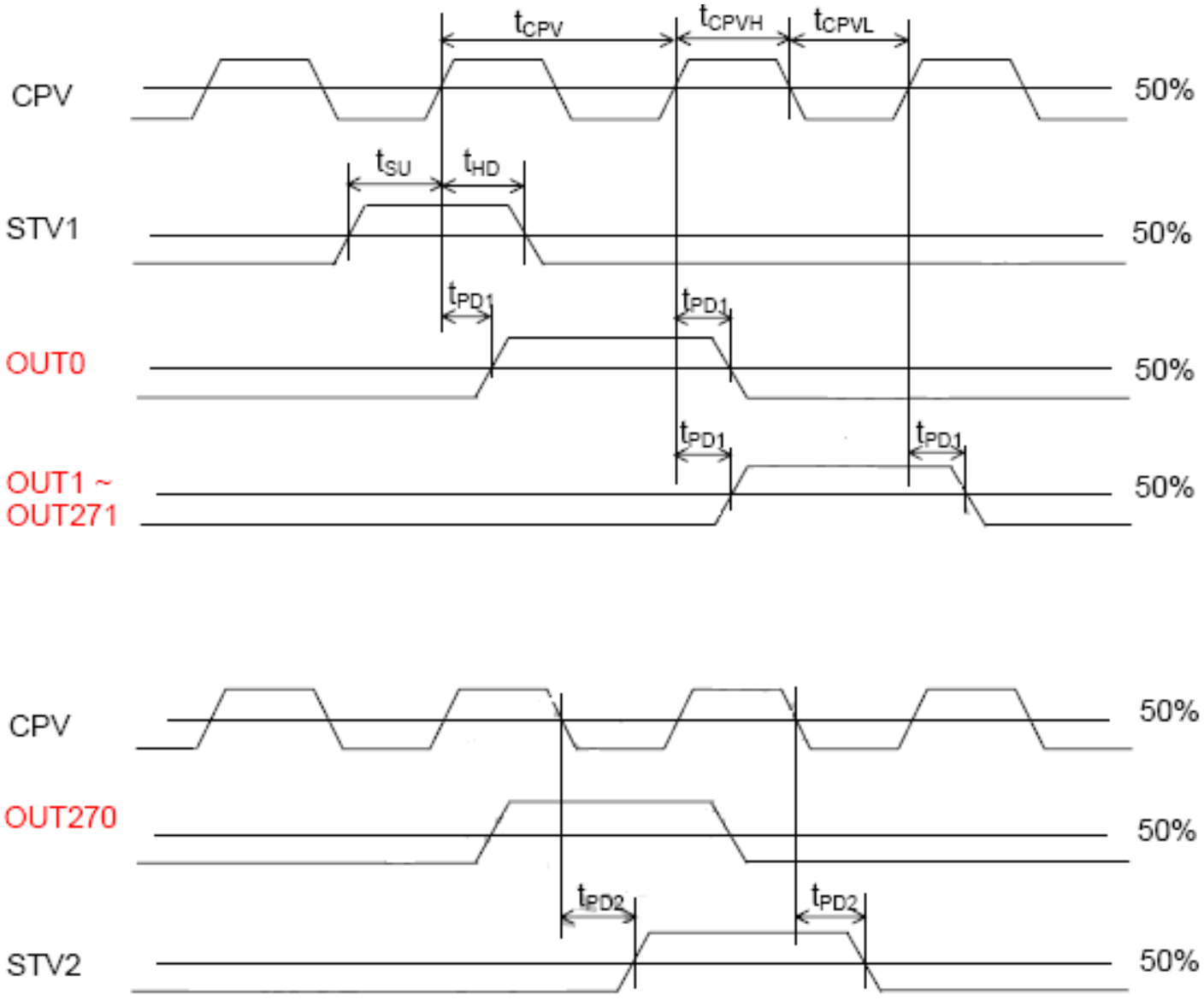
Last data sampling to TP1 timing for 726 channel case:



Relationship between EIO(OUT)and EIO(IN) timing for 726 channel case:



(c)Vertical Timing Chart

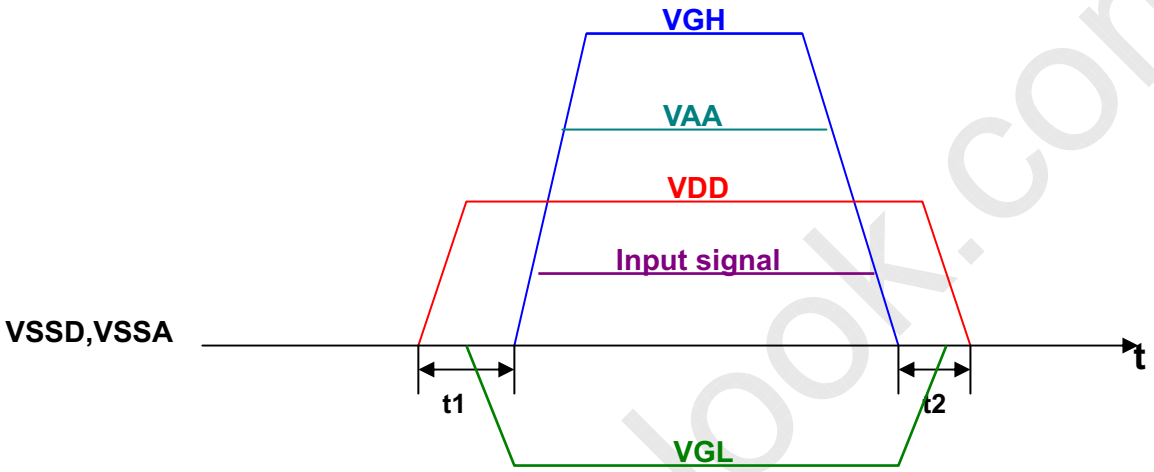


6.2 POWER ON/OFF SEQUENCE

To prevent the device from damage due to latch up , the power ON/OFF sequence shown below must be followed.

When power on : VDD → VGL → VAA → VGH , Input signal (t1＞0)

When power off : Input signal , VGH → VAA → VGL → VDD (t2≧0)



7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	12	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I_L	9.3±0.5	mA
Oscillating Frequency (Inverter)	F_W	40±3	KHz
Vertical Frame Rate	Fr	60	Hz

7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (7).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rcx	θ_x=0°, θ_Y =0° CS-1000T Standard light source "C"	Typ - 0.03	(0.649)	Typ + 0.03	-	(1),(6)
		Rcy			(0.331)		-	
	Green	Gcx			(0.271)		-	
		Gcy			(0.595)		-	
	Blue	Bcx			(0.148)		-	
		Bcy			(0.103)		-	
	White	Wcx			(0.313)		-	
		Wcy			(0.349)		-	
Center Transmittance		T%	θ_x=0°, θ_Y =0° With CMO Module	-	(4.5)	-	-	(2), (8)
Contrast Ratio		CR		(3000)	(4000)		-	(2), (4)
Response Time		Gray to gray	θ_x=0°, θ_Y =0° With CMO Module @60Hz	-	(6.5)	(12)		(5)
White Variation		δW	θ_x=0°, θ_Y =0° With CMO Module	-	-	(1.3)		(2), (7)
Viewing Angle	Horizontal	θ_x+	CR≥20 With CMO Module	(80)	(88)	-	Deg.	(2), (3)
		θ_x-		(80)	(88)	-		
	Vertical	θ_Y+		(80)	(88)	-		
		θ_Y-		(80)	(88)	-		

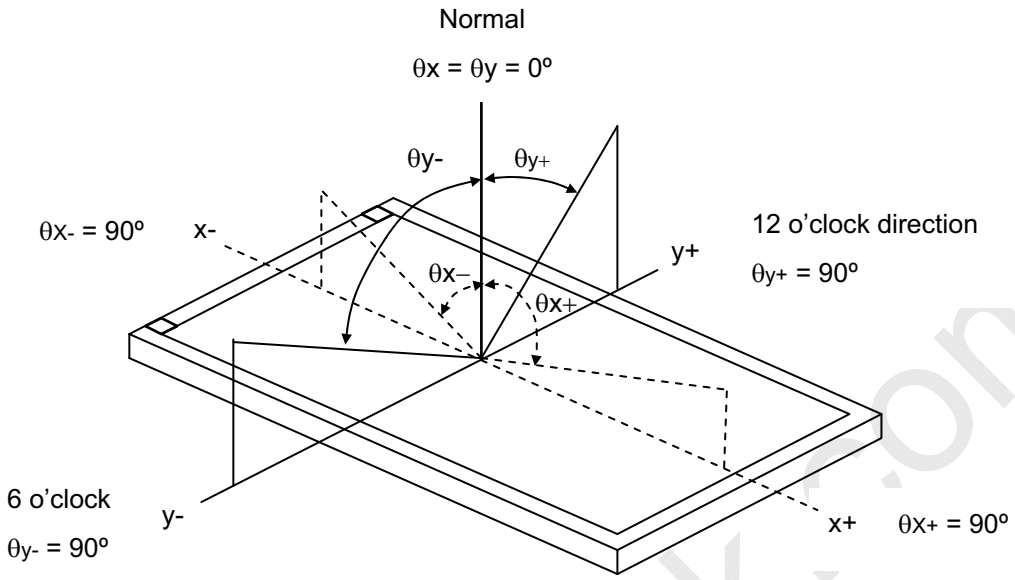
Note (1) Light source is the standard light source "C" which is defined by CIE and driving voltage are based on suitable gamma voltages. The calculating method is as following :

1. Measure Module's and BLU's spectrum. White is without signal input and R,G,B are with signal input. BLU(for V470H2-L01) is supplied by CMO.
2. Calculate cell's spectrum.
3. Calculate cell's chromaticity by using the spectrum of standard light source "C".

Note (2) Light source is the BLU which is supplied by CMO and driving voltages are based on suitable gamma voltages.

Note (3) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by Conoscope Cono-80



Note (4) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

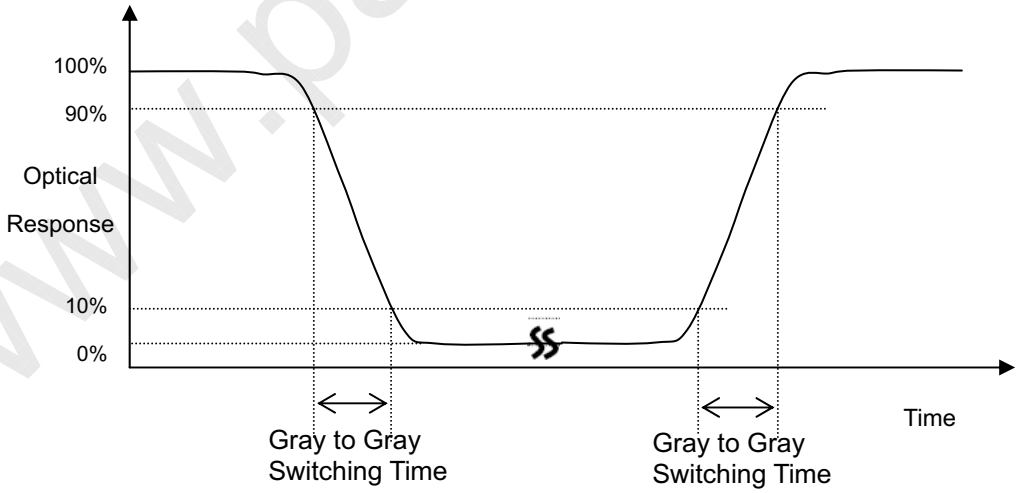
Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (1), where CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (8).

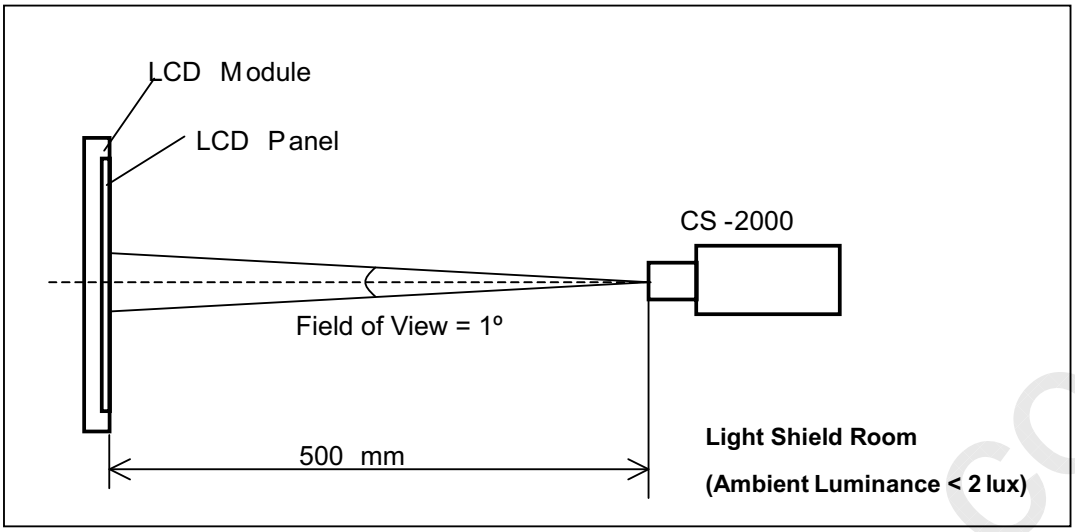
Note (5) Definition of Gray to Gray Switching Time:



Note (6) Measurement Setup:

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed

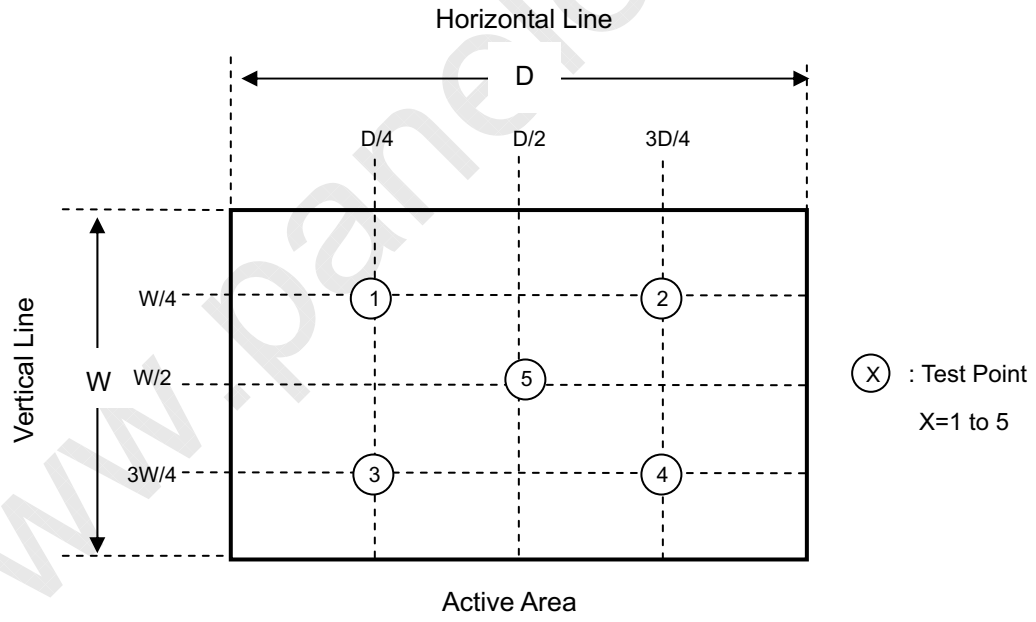
after lighting backlight for 1 hour in a windless room.



Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



Note (8) Definition of Transmittance (T%):

Module is without signal input.

$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$

8. PRECAUTIONS

8.1 ASSEMBLY AND HANDLING PRECAUTIONS

[1] Do not apply rough force such as bending or twisting to the module during assembly.

[2] It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

[3] Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.

[4] Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

[5] Do not plug in or pull out the I/F connector while the module is in operation.

[6] Do not disassemble the module.

[7] Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

[8] Moisture can easily penetrate into LCD module and may cause the damage during operation.

[9] When storing modules as spares for a long time, the following precaution is necessary.

[9.1] Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35℃at normal humidity without condensation.

[9.2] The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

[10] When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

8.2 SAFETY PRECAUTIONS

[1] The startup voltage of a Backlight is approximately 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the Backlight unit.

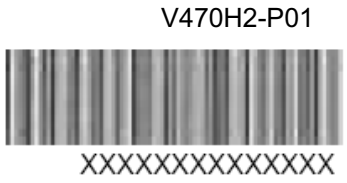
[2] If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

[3] After the module's end of life, it is not harmful in case of normal operation and storage.

9. DEFINITION OF LABELS

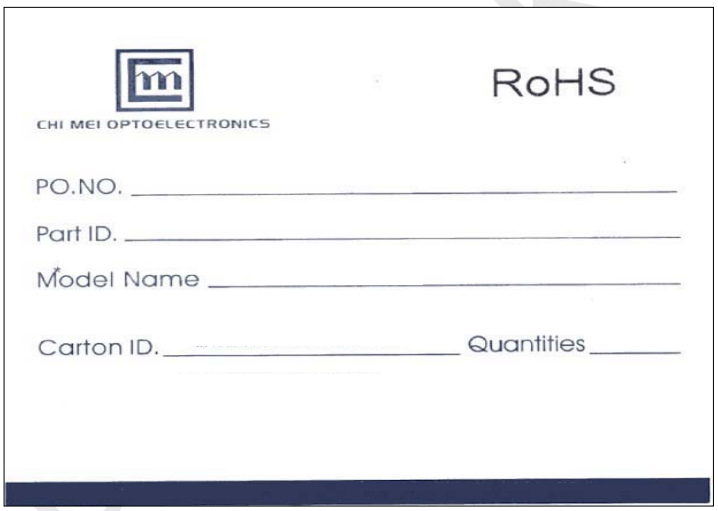
9.1 OPEN CELL LABEL

The barcode nameplate is pasted on each open cell as illustration for CMO internal control.



9.2 CARTON LABEL

The barcode nameplate is pasted on each box as illustration, and its definitions are as following explanation.



(a) Model Name: V470H2-P01

(b) Carton ID: CMO internal control

(c) Quantities: 8 pcs

10. Packaging

10.1 packing specifications

(1) 8 LCD TV Panels / 1 Box

(2) Box dimensions :1238 (L) X 842 (W) X 240(H)

(3) Weight : approximately 38Kg (8 panels per box)

10.2 packing Method

Figures 10-1 and 10-2 are the packing method

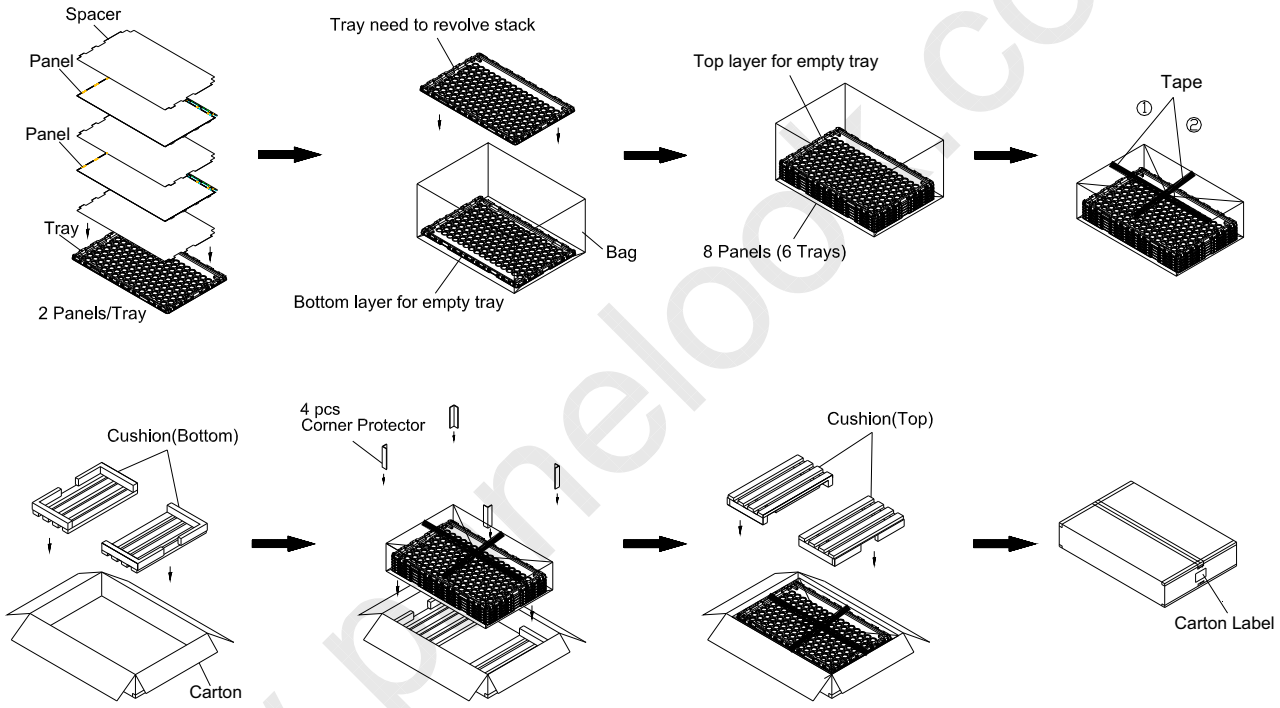
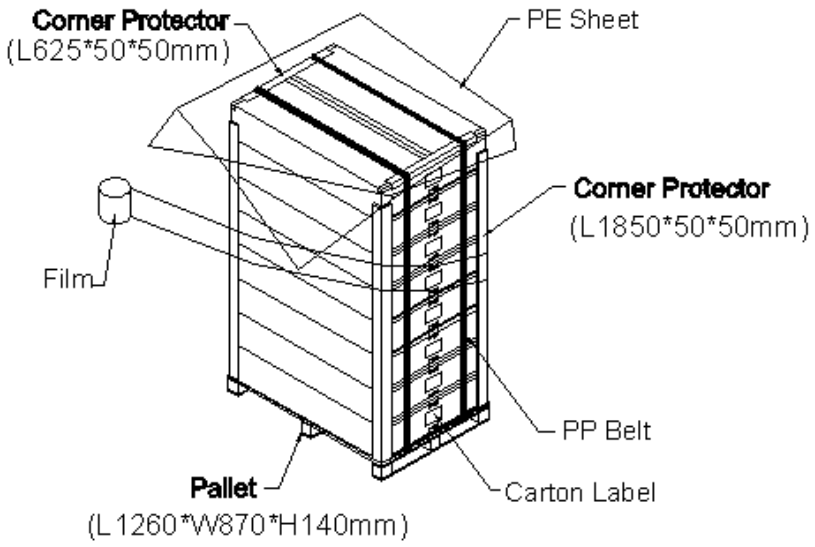


Figure.10-1 packing method

Sea & Land Transportation
Gross: 319kg



Air Transportation

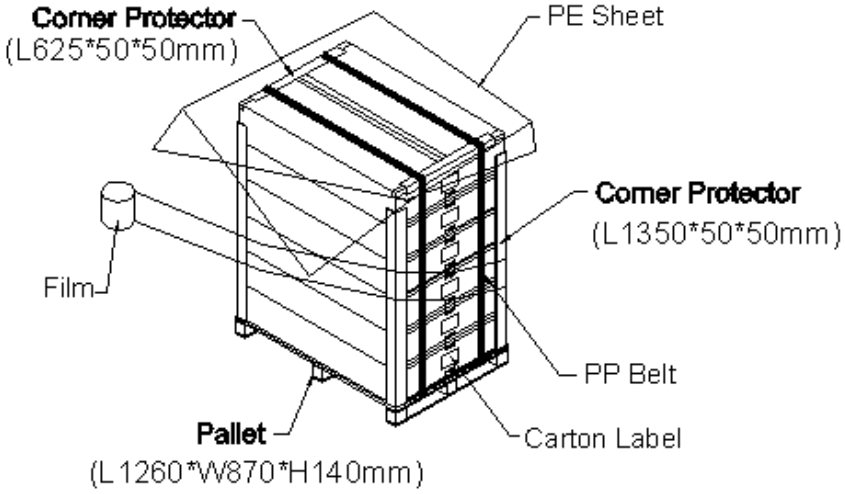


Figure.10-2 packing method

11. MECHANICAL CHARACTERISTICS